THE ELECTRICAL WORLD

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Electric Railways.

We herewith present to our readers a fine view of the motive power of the Portrush (Ireland) Electric Railway. A railroad operated by water power is a novelty; even more so than is a cable-road on which the cars are moved by being attached at will to an endless moving cable; because the cars are detached from any mechanical connection with the power-apparatus by which they are moved.

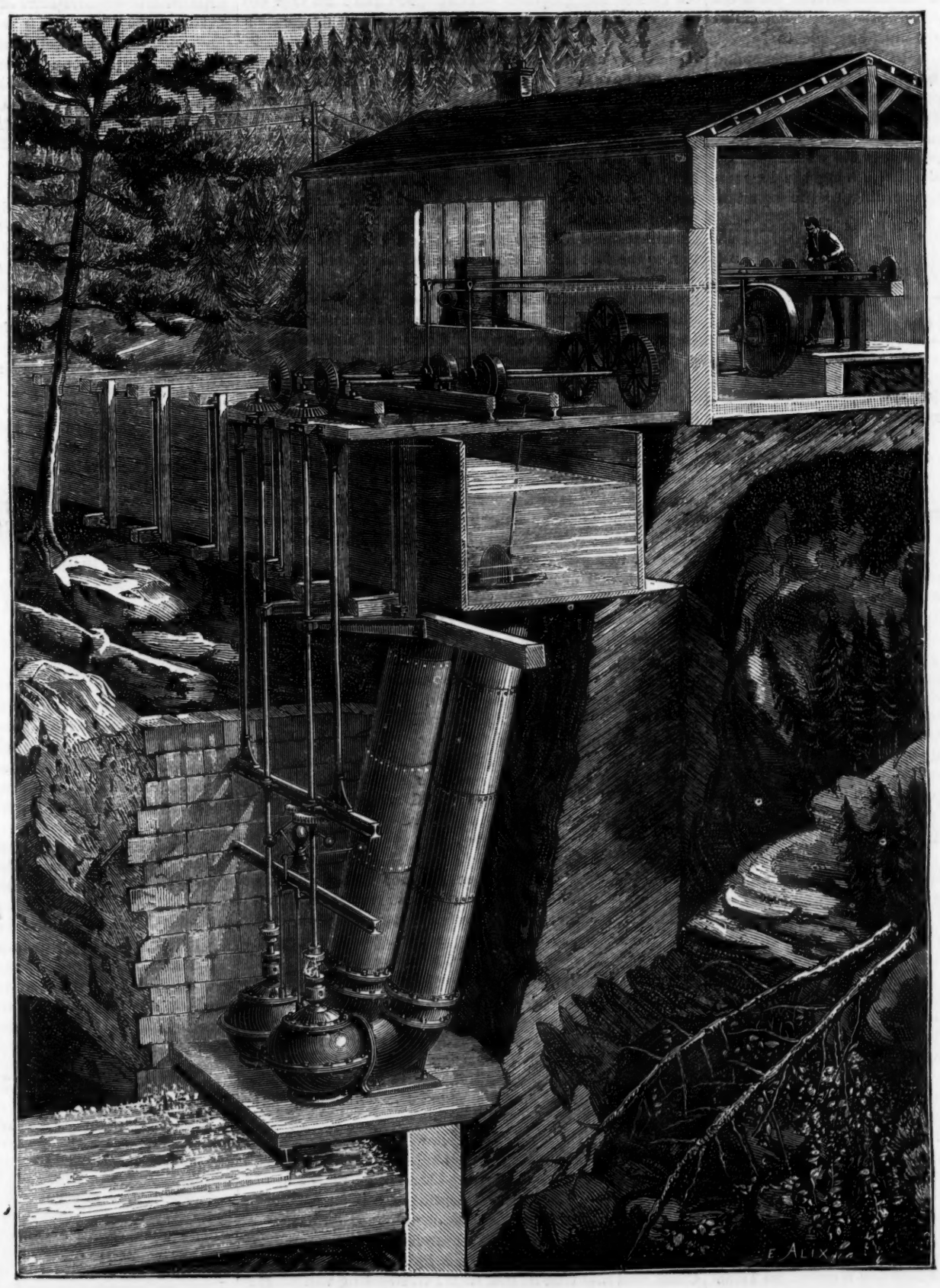
This conception of an apparently anomalous method of locomotion is due to the education of the public generally in steam railways and travel. But the electrician understands the whys and wherefores of this new system of travel, and is diligently seeking, not for the principles under which practice is to be guided, but for the electrical and mechanical details which go to make up an assemblage that can be worked in the best available manner, and at the same time with certainty and economy.

One of the first, if not the first, to conceive of an electric railway was our American inventor and scientist Page. But his locomotive was in effect but a modified steam locomotive. He carried his fuel and water in the shape of zinc and acid, which he consumed in the battery cells on his locomotive-carriage. His electro-motor was almost a steam engine in form and movement, for the reciprocating movements of four iron cones within the same number of solenoids gave rise to rotary motion of the driving wheels by means of cranks. As we observed last week in discussing telpherage, this tendency to preserve old forms and modes does not always lead directly to the best results. Independent of the expensive mode of generating electricity which Page had, his motor was decidedly an uneconomical one, because its capacity for utilizing, or converting to mechanical energy, the electrical energy developed, was quite low.

Dr. Werner Siemens, of Berlin, tried some experiments in electric railroading in Berlin in 1867. He says that he found that the then only commercially available mechanical source of electricity, the Siemens H armature machine, became too strongly heated in use to be of practical value for the purpose. So he abandoned the experiments and projects a short time thereafter, and only resumed them after the Gramme & Siemens machines became commercially known in 1873.

Unquestionably Messrs. Siemens & Halske, of Berlin, of which house Dr. Werner Siemens is the head, and Messrs. Siemens Bros., of London, of which house the late lamented Sir William Siemens was the head, have taken the foremost steps in electric railroading. Whether they are still foremost and will continue so remains to be seen. It would certainly be more than ordinarily wonderful if they should retain the front rank in that growing art, in the field of which so many keen and energetic men are working, hoping to excel. Be that as it may, nothing can now be said on this subject if the Messrs. Siemens be ignored.

More than one system of electric transportation of goods has been devised. The telpherage system which we described in our last week's issue is an illustration in point. Others may be devised; but it seems absolutely to be the case that the same electrical and mechanical principles govern those systems we know, and will govern those we now know not of. We say this because the laws of electricity and mechanics seem to be immutable. Therefore, it seems well to introduce this short series of articles on this interesting subject by giving a statement of the electrical principles involved. To do this, the most natural way is to consider the accepted electric quantities or values in their relation to one another and to the mechanism necessarily used.



THE TURBINES USED FOR THE PORTRUSH ELECTRIC RAILWAY.

First, there must be a prime mover, which may be of any kind which will be reliable, constant and economical. It need not, of necessity, be located directly on the railway line, but may be located a considerable distance therefrom, but always within such bounds as the economical considerations of cost of plant, in shape of conductors from the dynamo to the rails, and the inevitable constant waste incident to conductors absorbing energy necessitate. Often in such portions of countries where electric railways are most likely to be built first—namely, sparsely settled parts where the more expensive steam roads cannot pay—water powers waste their energy day by day, and therefore are held at low prices, which should tempt the electrical conserver of energy for transportation purposes. At first the Portrush road used a steam engine for its prime mover, but after the road reached the length of six miles water power was utilized, and is now used for operating the completed road, which is ten miles in length. It is this water power which we here illustrate, and which we will describe in its course.

Other natural powers, like wind and tide, may be eventually used when found to be more available or more economical, provided equalizers of their emissions of energy be adapted to the apparatus actuated by them. Wind and tide are so intermittent they are not to be directly depended upon for constant effects. But by combinations of wind or tide motors with pneumatic, hydrostatic, or electric reservoirs or accumulators, we may yet gain reliably constant sources of electricity for railroading and other purposes. There is nothing fundamentally in the way of accomplishment of this desideratum, and it seems only to need the incentive of probable profit to insure the invention and application of apparatus for further utilizing the forces of nature through the aid of electrical appliances.

Having now provided one of the several available prime movers, steam, water or wind motors, the next in order is the apparatus for generating the necessary electricity. The character of this generator, so far as the two vaguely-used terms, "quantity" and "tension" are concerned, is determined by the system of running the cars, whether the "parallel" or "series" system has been selected. The parallel system requires a current of volume which is divided between the several motors on the tracks somewhat as a stream of water may be divided to flow through several channels. The electromotive force of the divided

current may not exceed that which is considered the most economical under the conflicting conditions of cost, sizes and resistances of conductors, degrees of insulation of track. The series system requires other conditions, such as, unlike those of the parallel, a current of higher electromotive force, but of less volume. Consequently insulation must be more carefully attended to.

For illustration, suppose in both cases ten locomotives are on the section of railway supplied by one generator of electricity, and that each locomotive requires ten horse-power, or 100 horse-power in all. Expressed, then, in terms of electrical energy, each locomotive requires 7,460 watts, and the ten require 74,600 watts. This unit, watt, is the product of the electromotive force in volts multiplied by the current in ampères, or $E \times C = W$. Having then constructed the electro-locomotives to run each by a current of 100 volts tension and 74.6 ampères intensity, we may place them on suitable road-ways so that a current of 746 ampères and 100 volts may be divided among them. In this way energy is distributed among them by *division of the ampères* of current, the prime generator being constructed to furnish the quality of current necessary.

We may convey the same energy to the same locomotives by arranging the track so that current from the generator passes through them in the succession called serial. But the prime generator must be made to furnish a current of another quality—one of greater tension and less volume—greater number of volts and less number of ampères. Have the generator, then, of 1,000 volts and 74.6 ampères capacity, and we have the same work done, as this equation shows :

$$1{,}000 \text{ volts} \times 74.6 \text{ ampères} = 74{,}600 \text{ watts.}$$

In this case the energy is divided among the locomotives by division of the volts according to the equation $\frac{1{,}000 \text{ volts}}{10} \times 74.6 \text{ ampères} = 7{,}460$ watts for each locomotive. □

(TO BE CONTINUED.)

American Institute of Electrical Engineers.

A large and enthusiastic meeting of the above society was held at the rooms of the American Society of Civil Engineers, Tuesday evening, May 13, 1884.

Mr. Joseph P. Davis, Chairman of the previous meeting, presided.

The minutes of the meeting of April 15 were read and approved.

The Committee on Organization reported that they had completed a proposed set of rules for the government of the Institute and had nominated a sufficient number of persons to fill the offices.

The rules were then read and considered by the meeting in detail, and, with some amendments, adopted. They were to this effect : That the Institute shall consist of members, honorary members and associates. Members and honorary members shall be professional electricians and electrical engineers. Associates shall include persons practically engaged in electrical enterprises, and all suitable persons desirous of being connected with the Institute. Each person desirous of becoming a member or associate shall be proposed by at least three members or associates, canvassed by the Council and elected by a majority of the members and associates as expressed by letter ballot to a regular meeting of the Council. All members and associates shall be equally entitled to the privileges of membership.

The entrance fee shall be five dollars for each person. The dues and fees of members and associates shall be ten dollars per annum, payable in advance. The affairs of the institute shall be managed by a Council consisting of a President, six Vice Presidents, twelve Managers, a Treasurer, and a Secretary.

Various details as to the duties of officers, qualifications for membership, manner of election, term of offices, number of meetings, the papers and transactions, etc., were adopted in the Rules, which will be printed for the use of he members.

The Chairman appointed Messrs. Sargeant, Delano and Ross scrutineers of the ballots for officers. The election of officers was then proceeded with, with the following results: For President; Norvin Green ; for Vice Presidents. A. Graham Bell, Charles D. Cross, Thomas A. Edison Geo. A. Hamilton, Charles H. Haskins, Frank L. Pope ; for Managers, Charles F. Brush, William H. Eckert, Stephen D. Field, Elisha Gray, Edwin J. Houston, C. L. Hillings, Frank W. Jones, George B. Prescott, W. W. Smith W. P Trowbridge, Theodore N. Vail, Edward Weston: for Treasurer, Rowland R. Hazard; for Secretary, Nathaniel S. Keith.

The following communication was then read:

UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., May 12, 1884.

N. S. Keith, Esq., Secretary :

MY DEAR SIR : I find at this late day that it will be impossible for me to be with you to-morrow at the organization of the Institute of Electrical Engineers, owing to sickness in my family. It was my especial desire to be with you during this meeting and to call the attention of the members to the existing condition of the Patent Office, its relation to inventors, manufacturing interests, and in general to the advanced position among the nations of this generation, owing more than for any other reason to our liberal patent system. I wanted particularly to call attention to the Platt bill introduced into the Senate by Senator Platt, and providing for a Patent Office Department entirely distinct from overruling authority other than the Commissioner of Patents. You will confer a special favor upon me by bringing this matter to the attention of the Institute and asking them to call upon Congress to pass the bill. It is a burning shame upon our national reputation that Congress should have permitted inventors to pay into the United States Treasury $2,500,000 over and above the expense incurred in examining and issuing patents, but such is the fact. During the past year this Bureau deposited to its credit over $471,000 more than was expended in the granting of patents for the current year. Is not this taxation without representation, and are inventors to sit idly by and submit to this, while the Patent Bureau is crowded out of its building by other branches of the Interior Department?

I transmit herewith a report to Congress by the Commissioner concerning the condition of the work in the Patent Office. I would be glad if you would call the attention to my report therein in relation to the class of electricians and beg to advise you that since it was written two of my assistants have resigned and I am now 600 cases behindhand, so that were you to file an application to-day it would be four months before I should reach it. It is simply absurd that the Congress of this great country does not have the foresight to realize that by thus hampering this Bureau, they are throttling the onward progress of an advanced civilization and unjustly robbing the inventor of funds which the founders of the Constitution never intended should be so diverted. Every dollar taken from the inventor by this direct taxation should be invested as was intended, so as to give him such an examination as the law calls for and to insure an expeditious examination of his application. I desire also to call attention to the fact that serious attempts have been made by Western Congressmen to shorten the life of American patents, but fortunately such attempts have all so far failed. Please give this matter your earnest attention and impress upon the Society our desire as a Bureau to be placed on an independent footing free from all trammel and where we can use the funds deposited by inventors exclusively for the purposes for which they are designed. It is not designed to make the head of such a department a Cabinet officer, nor is such a proposition desirable! Only let us be so situated that if we desire additional room, additional force or anything which will materially aid us in the transaction of the business of the Bureau, we shall not be humiliated by being dictated to as to how we shall use our facilities or dispose of funds designed for a special purpose. I regret exceedingly that I cannot be with you to lay this matter before your meeting, but I feel sure that with these few suggestions you will do the proper thing.

Pardon this long letter, but rest assured that it is only an earnest desire to see justice done to this Bureau and to inventors that prompts me to action.

Consider me in hearty accord with the Institute.

I remain very respectfully yours, C. J. KINTNER,
Examiner, Class Electricity, U. S. Pat. Off.

The meeting then passed the following resolution, which was offered by Prof. W. P. Trowbridge: "That the influence of the members and associates of the American Institute of Electrical Engineers should be exerted to prevent any restriction of the rights and privileges of inventors as they now exist under the laws, and that the Institute of Electrical Engineers earnestly desires the passage of Senator Platt's bill or its equivalent in order that the work of the Patent Office may be put on a more efficient footing."

The meeting then passed the following resolution, which was offered by George S. Bowen : "*Resolved*, That the Chair appoint a committee of three, who shall take such action as they may deem proper with a view to calling the special attention of Congress to the needs of the Patent Office, especially in regard to the class of Electricity."

The meeting then passed the following resolution, which was offered by Gen. C. H. Barney : "*Resolved*, That the thanks of this meeting be tendered to the Committee on Organization for the efficient manner in which they have performed their duties."

The meeting then passed the following resolution: "That the thanks of this meeting be tendered to the American Society of Civil Engineers for the kind offer of the use of the rooms of this Society for meetings until such time as the Institute may secure rooms for its purposes."

Mr. Isaac Trumbo, of San Francisco, made some remarks on the state of electric lighting on the Pacific Coast, and said that he had been investigating various systems of electric lighting for use in the West.

On motion, the meeting then adjourned, subject to the call of the Council.

Electrical Experts in Patent Causes.

BY R. M. HUNTER, M. E.

Electricity forms to-day the subject-matter of an enormous number of patents, many of which infringe upon each other to a greater or less degree. This infringement, though unfelt by large numbers at the present time, will not remain latent forever, and in the course of a few years the bulk of patent litigation will unquestionably embody electrical devices of some kind. Even at the present day there are a large number of electric cases on the court dockets. In these patent cases it is the practice of the contestants or their lawyer to retain experts, whose duty it is to aid the side on which he is retained in pointing out to the Court the essential features of the invention, as set forth, illustrated and claimed in the patent; show its advantages or defects, as the case may be, and interpret all matters purported to be anticipations of invention. Much depends upon the expert, as in nearly all cases the Court is not versed in the science of the matters under controversy, and the judges therefore rely upon the evidences of infringement deduced by the experts and consider them in connection with the proofs of the defense.

An expert in a patent case cannot be simply an electrician, no matter what his knowledge of the science may be, but must be equally good in reading and interpreting patents, and should have a good general knowledge of patent law as well. Until recently a mechanical expert was the demand, but it is gradually and surely changing to a call for electrical experts, and good electrical patent experts are scarce at the present time, though the future increased demand will also increase their number.

To the general public a patent specification seems a simple, clear, and comprehensive instrument, but to those initiated into the mysteries of patent law, they invariably present great difficulties not readily overcome, being in nine cases out of ten badly drawn and, particularly, badly claimed. It takes an expert to understand their true meaning and scope. It is his duty to compare the claims with the prior state of the art, considering them with all conceivable constructions and interpretations placed thereon, never losing sight of the fact that double use and mechanical skill are equally effective weapons in dealing with patents.

The course of the prosecution or defense depends much upon the proofs of the expert, and in many instances entirely. It is therefore necessary, in acting in electrical cases, that he be not only familiar with the electrical science practically, but theoretically as well, for it is within his sphere to prove that the patent is inoperative or defective, or that alleged anticipating inventions will or will not work practically, as the case may be, by theoretical reasoning and practical tests and experiments. In addition to the reasoning power and sense of perception, it is also desirable that the expert be efficient in drawing, for it becomes necessary in many cases to illustrate answers in the testimony by sketches which shall be both to the point and comprehensive. This will often explain to the Court what could not be easily understood from words alone. This use of illustrations in answers also plays an important function in the analysis of inventions which it often becomes necessary to do, thus tearing away the outer cloak or disguise and disclosing the same principles involved; but this practice of analysis is not generally understood or appreciated as yet, as it will be in the future, and there are but few who are capable of accomplishing it, for it requires that the expert be an inventor of quick perceptions as well.

Electrical experts must also be versed in the mechanical arts and sciences, for in nearly all electrical contests these figure, to a more or less extent, and hence an expert in a patent case involving the application of electricity must be educated not only in mechanical but the electrical sciences as well, and requires in most cases a good general knowledge in theoretical and applied physics and chemistry, also.

In summing up, then, an efficient patent expert in a case involving the application of electrical principles should be, 1. Thoroughly capable of reading and interpreting patents. 2. Should have a general knowledge of patent law. 3. Should be thoroughly versed in theoretical and applied mechanics (especially mechanical principles and mechanism) and electricity. 4. Should have a good general knowledge of chemistry and physics. 5. Should have a knowledge of the state of the art. 6. Should be efficient in drawing, and 7. Should be good at analysis of inventions, and, preferably, an inventor of quick perceptions.

WESTERN UNION TAXES IN PENNSYLVANIA.—Judge Simonton, of Pennsylvania, has filed an opinion in the case of the Commonwealth against the Western Union Telegraph Company, from which over $147,000 was claimed as tax on stock dividends declared for the years 1879 and 1881, with penalties and interest. This is the case which the Western Union endeavored to settle a few months since by paying the State $50,000. The decision of the Court sustains the view of the corporation, that if taxable at all on the alleged stock dividends declared, it could only be made to pay on the basis of the proportion which the company's combined pole and wire mileage in the State bears to the total combined pole and wire mileage in the country. The conclusions of the Court are as follows : The company in March, 1881, made and declared stock dividends amounting in the aggregate to $19,950,240, and is taxable at the rate of one-half mill upon its capital stock for each 1 per centum of dividend. The company is not liable for any penalty for failure to report, as it had notified the Auditor-General that its capital stock had been increased to $80,000,000. The company cannot be charged for interest prior to the date of the settlement made with the accounting department of the State. In this case the Court holds that the company is liable for the payment to the State of $44,056.96, which includes $1,881.28 as the Attorney-General's commission. The Court also charges the company with an indebtedness of $13,481.94 on account of non-payment of the tax on stock dividends declared in 1879.

How to Construct a Galvanometer.

BY THOMAS R. TALTAVALL—PART III.

This is done by connecting the end of the coil of no resistance (the copper band) with the beginning of the one-ohm coil; the end of the one-ohm coil with the beginning of the coil of ten ohms; the end of the latter coil with the beginning of the one of 50 ohms, and the end of the 50-ohms coil with the beginning of the one of 100 ohms. The beginning of the band and the end of the 100-ohms coil will be the extreme terminals of the entire coil, that is, all the coils joined together as one. It will not be convenient just now to join the end of the band with the beginning of the one-ohm coil; therefore we will pass that point for the present. The first connection we can make at this stage is between the end of the one-ohm coil and the beginning of the one of 10 ohms, then continue through the series in the order already given. The proper way to make the splices is to first remove the insulation for two or three inches from the ends, then polish the surface of the wire with fine emery paper, to insure a good contact, and then twist the ends together the entire length of the portions uncovered. The joint must be made by placing the wires parallel to each other and not end to end. Thus we will have a common end for the two wires, with which to make a connection with the proper binding post.

After the joints have been made we must tag the ends with "1 and 10," "10 and 50," and "50 and 100," which represent respectively the connections between the 1 and ten ohms coils; the 10 and 50 ohms, and the 50 and 100 ohms

The frame is now ready to be permanently attached to the base of the instrument. Before doing this, however, locate the centre of the base, on its upper surface, by boring a small hole through from the under side, where the exact centre is already marked. In placing the frame in its permanent location its centre must be as nearly as possible over the centre of the base, and its longer sides must be parallel to the longer sides of the latter. See Figures 8, 9 and 10, which are respectively the plan, the elevation and a sectional view of the instrument. *A* and *A'* in Figs. 8 and 10 show the sides of the frame.

Next cut a slit through the base large enough to pass the

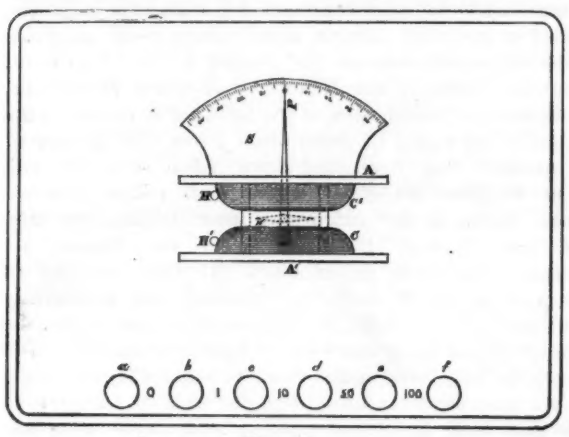


FIG. 8.

depending narrow copper strips through with ease. *B* in Fig. 10 shows these strips as they pass through the base. Also bore two holes at one end of the frame (one on each of the inner sides) through which to pass the several ends of the wires. *H* and *H'* in Figs. 8 and 10 show the location of these holes, and in Fig. 10 *w* and *w'* show the wires as they pass through. Now we can glue the frame to the base. See Figs. 8, 9 and 10 for its position on the base.

Now procure six binding posts and place them equidistant on the back edge of the base, as shown in the plan, Fig. 8. They will probably cost 10 cents each.

Next push a narrow strip of stiff paper, or cardboard, up between the two copper strips, as far as the top of the box at *D* in Fig. 10. This insulates them. Now take the first strip, which is the one that leads to the top of the box, and is the beginning of the coil of no resistance, and bend it, underneath the base, at the proper angle, so it will reach binding-post *a*, Fig. 8. When this is done, permanently, connect the strip with the binding-post. Then take the other strip—the end of the band—and lead it to and connect it with binding-post *b*. To the same post connect the "beginning of the one-ohm coil." Thus the end of the band and the beginning of the one-ohm coil will be connected. Next take the joined wires of the end of the one-ohm coil and beginning of the 10-ohms coil and make a permanent connection with binding-post *c*. Then connect the end of the 10-ohms and beginning of 50-ohms coils with post *d*; the end of the 50-ohms and beginning of 100-ohms coils with post *e*, and the end of the 100-ohms coil with binding-post *f*.

Fig. 11 shows the theoretical winding of a galvanometer coil. A little study of this figure will enable us to better understand the combination of the various coils. Supposing a current enters at *a* and leaves at *f* it must necessarily pass through the entire length of wire in the coil; in other words, it passes through each of the component coils in succession. If we connect the battery wires with *a* and *e*, the current flowing in the same direction as before will pass along the coils until it reaches the point *e'*, where it will be diverted and pass out at *e*. Thus the 100-ohms coil is practically cut out of the circuit. If we connect the return wire with *d*, the current will on reaching point *d'* be diverted to *d* and out, and the 50 and 100 ohms coils will be cut off. The 10, 50 and 100 ohms coils will be cut out of circuit with the wires connected at *a* and *c*, the current flowing out at the point *c'*, and with *a* and *b* connected only, the coil of no resistance, *i. e.*, the copper band, will be in circuit. The current will pass around the needle once to *b'*, then out.

We now need a degree scale to enable us to measure the deflections of the needle. A card-board semi-circular protractor, 4 inches in diameter, can be purchased of almost any dealer in mathematical instruments for ten or fifteen cents, and will answer the purpose excellently. If one cannot be purchased, we shall have to make one as

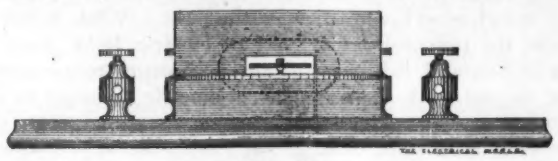


FIG. 9.

shown in Fig. 12. It is assumed that the person making an instrument after these instructions has sufficient knowledge of geometrical drawing to undertake the task of drawing such a scale. The dotted lines will be referred to presently. The position of the scale with regard to the instrument will be immediately in front of, and on a level with, the opening of the needle box, as shown by *S* in Figs. 8 and 10. The scale is also shown in Fig. 9, across the front of the frame, immediately under the opening.

After divesting the scale of the portions marked by the dotted lines, attach it with glue, or otherwise, to a piece of thin, flat wood, in order to secure a smooth and level surface. Then trim off the wood to conform to the curve of the scale. The actual shape of the latter, attached to the instrument, is shown by *S*, Fig. 8.

If we connect the two ends of the arc of the scale in Fig. 8 by a chord we will find that the length of the chord will be equal to that of the front of the frame. This is the rule to

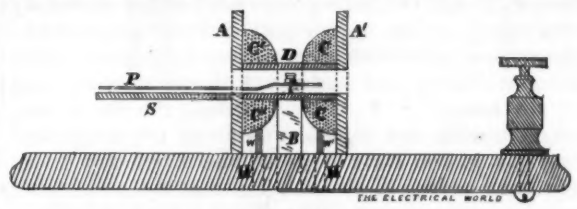


FIG. 10.

guide us in cutting off the corners of the scale. They may be cut off by a straight line. They look better, however, when cut as represented in the figure. Curves always please the eye more than straight lines. The object in cutting off these corners is simply to economize in room. They are of no practical use, so it is better to have them out of our way. The width of the straight piece cut off from the scale is equal to the distance from the centre of the box to the front surface of the frame at the box opening. It is evident, therefore, that the centre of the box, at which point the needle will be suspended, will also be the centre of the scale. The dotted outlines of the needle are shown in Fig. 8. Extending at right angles therefrom is a pointer, or index. As the needle moves, the pointer moves with it over the scale. The needle and its index will be considered more fully in their order. The centre of the straight edge of the scale must coincide with the centre of the edge of the box opening.

A small block of wood might, with advantage, be placed

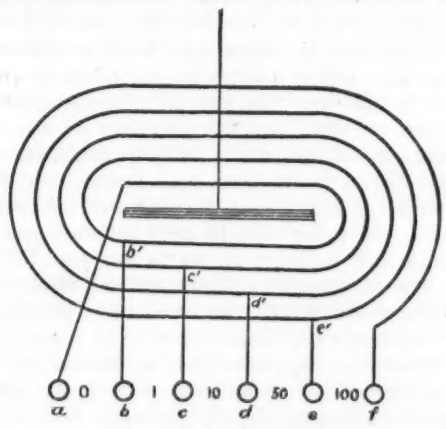


FIG. 11.

under the scale at right angles with the frame, in order to hold it more securely in place and level.

Glue the scale to the frame.

[CORRECTION.—In Part II. of this article it was erroneously stated that the actual resistance of the coils would probably be a little *short* of what they represented, on account of the impurity of the wire. The sentence should have read: "The actual resistance of the coils therefore is likely be a little *more* than what they represent."]

(TO BE CONTINUED).

An Important Suspension.

One of the firms that have failed in Wall street this week is that of A. W. Dimock & Co., whose senior, Mr. A. W. Dimock, is president of the Bankers and Merchants' Telegraph Company. This gentleman, well known for his enterprise and ability, has had an eventful career, losing two or three large fortunes. Some time after the crash in 1873, and when he had resumed his connection with Wall street, he became interested in telegraphs, and a syndicate of New Yorkers and Philadelphians having formed the Bankers and Merchants' Telegraph Company, with a capital of $75,000, Mr. Dimock became interested in the company, and when the stock had been increased to $300,000, he attempted to gain control. In this he was defeated through the pooling of the stock of the other associates. An agreement, however, was entered into between them whereby he paid $300,000 in cash into the treasury and received $300,000 in first mortgage bonds at par. With these at their par value he bought out the other stockholders, paying them at the rate of 140 for their interest. He then began to branch out largely; he had the company's charter amended and the stock capital increased to $2,000,000 bonds and about the same amount of stock. He bought out the Rapid Telegraph Company of Boston, the Southern Telegraph Company, Board of Trade Line from Kansas City to Chicago. In addition he was engaged in extending the lines of the Southern Telegraph Company to New Orleans, two lines to Chicago from this city, and increased the six wire plant of Bankers and Merchants', which had been extended from New York to Washington, besides expending $675,000 cash on the work of that line. He was on the eve of amassing a large fortune when the crash came this week, his loans were called in on the Bankers and Merchants' Telegraph Company bonds he had hypothecated, and the stock, which was selling at 119½, fell to 45 on Thursday, and Mr. Dimock was obliged to fail for the third time.

As soon as the failure of Dimock & Co. was announced, the stock of the Bankers and Merchants' Telegraph Company, which closed at 119 on the previous evening, fell to 45. For a time other telegraph stocks were slightly affected, but they soon rallied. A reporter who called at the office of the Bankers and Merchants' Telegraph Company, No. 187 Broadway, was informed that Mr. Dimock was, up to the time of his failure, the financial agent of the concern. In the absence of Secretary J. G. Case, his assistant stated that the failure of Mr. Dimock in no way interfered with the ramifications of the company. "We are going on as usual with our business," he continued. "The fall in our stock was inevitable, I suppose, following the other failures, but everything will be all right in a

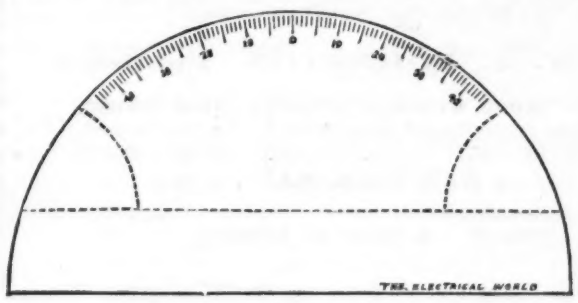


FIG. 12.

short time. The market has already rallied, so that the worst has passed. We have already held a conference with a number of our contractors, who are constructing our extension lines, and they express their willingness to go on with the work. I do not deny that the fall in the stocks will, to some extent, delay our extending the lines, but beyond this we shall not in any way suffer from embarrassment." Mr. Dimock is also President of the Commercial Telegram Company.

The Overland Telephone in Indiana.

A complaint was filed in the Indianapolis Federal Court, on May 6, by the American Bell Telephone Company alleging that the Indiana Overland Telephone & Telegraph Company is infringing upon its patent. Since 1878 the Bell company has been given judgment in infringement suits against seventeen telephone companies and corporations that have been organized in different parts of the country. It is claimed in the complaint that electric speaking telephones had never been publicly known before the grant of a patent to Alexander G. Bell, in February, 1876, and all instruments that have since been produced have been infringements of this patent. The Bell telephone, it is stated, is now in operation in more than one thousand towns and cities, in every State, and in all cities of more than five thousand population. All exchanges use telephones licensed by the Bell company upon which a royalty is paid, and there are now over three hundred thousand licensed telephones in use. The Indiana Overland company began operating on the 1st of last February, and the plaintiffs claim all money that has been earned by them under the alleged infringement of the Bell patent. The plaintiff company pray for relief against the defendant, and petition that the Overland company may be decreed to account for and pay over to the Bell company all its gains and profits accruing from the use and sale of telephones in Indiana since February 1, and that they be perpetually enjoined from further infringing upon the plaintiff's rights. The Overland company is composed of D. P. Erwin, H. C. Adams, W. G. Wasson, M. H. Spades, R. L. Scarlett, W. R. Kerwood, N. S. Bryam, O. S. and M. T. Runnells, and L. B. Kerfoot, all of Indianapolis.

THE

ELECTRICAL WORLD,

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W. J. JOHNSTON, - Editor and Publisher.

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T. C. MARTIN, - - - - - News Department.

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Mr. Mailloux's articles are marked thus: *,*. Mr. Keith's thus: □.

The Department of Inquiries and Our Illustrated Record of Electrical Patents are edited by Mr. Keith.

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W. J. JOHNSTON, Publisher,

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NEW YORK, MAY 17, 1884.

A TRIP TO EUROPE.

The Editor and Publisher of THE ELECTRICAL WORLD begs to announce that he intends sailing for Europe on Thursday, May 29. He will be glad if those who wish to see him personally on business or to write to him before he leaves, will make note of the date. During his stay on the other side he will visit the principal cities, and if there is any business he can transact for the subscribers and advertisers of this paper, he will be happy to devote his time and attention to it for them.

DISHONEST FOES OF ELECTRIC LIGHTING.

It seems to us that the opponents of electric lighting and the advocates of gas or oil lighting, must be very sorely pushed when they can publish such wholesale falsehoods and misrepresentations as we find in the *Alta California* of San Francisco, April 28, and in another paper, whose name we have not learned, but one of whose tangled misstatements is now before us. Attacks on the electric light, from interested quarters, are looked for, and, so far, the expectation has been liberally met, but it is seldom indeed that one has to deal with so much astounding ignorance or willful falsification of facts in a widely-known paper as is exhibited by our Californian contemporaries. We are willing to credit the *Alta California* with ignorance, if it wishes.

We do not care, as a rule, to give much of our space to these onslaughts upon the electric light, but it may be as well to show how violent, unscrupulous and bitter some of them are. The *Alta California* says: "A little inquiry reveals the fact that electric lighting has not been found a success in other large cities." This, as many of our readers know, is absolutely untrue, even though it has the distinguished support of the other paper, which says: "In every instance the electric light has failed to give satisfaction." Descending from the general to the particular, the *Alta California* adds: "In London and Paris within a short time, the electric light bids fair to be among the things that were." After this we are not surprised to read all the old nonsense about the danger of the electric light and other objections to its use.

The most wanton and impertinent misrepresentation is that in which Mr. W. H. Preece's valuable paper on "The Progress of Electric Lighting," read before the English Society of Arts on March 5, is made by the *Alta California* to be "the *coup de grace* to the electric light for street purposes." The other paper says, too, that Mr. Preece "distinctly scouts the idea that in the wholesale lighting of cities can any economy be effected by the substitution of the electric light for gas. The article, while acknowledging the progress of electric light as a costly scientific experiment, regrets, in despairing terms, its failure as a commercial enterprise." If we were to say that Californian papers were in the habit of advising everybody to leave the Pacific Slope because the experiment of trying to live there was a sad and costly failure, we would be about as near the truth as the two passages are we have just quoted. Mr. Preece's paper, be it noted, is on the progress of the light. While it condemns the immoralities of recent electric light financing in England, it is cheerful and optimistic from beginning to end. Mr. Preece says: "Electric lighting is a pronounced success," and he goes on to show what a success it is in spite of an Act of Parliament that is soon to be modified as detrimental to the public good, although its aim, the prevention of monopoly, is praiseworthy. Let us quote further: "I see no reason whatever why our public streets should not be as efficiently lighted by electricity as they are now by gas, and for the same price. * * * The best lighted street in the city of London is the Holborn Viaduct. * * * It is remarkable how the use of electricity is growing in favor with theatre managers. * * * Our new Law Courts are admirably lighted, and some of the judges have said that the electric light is the only good thing in this new Palace of Justice. * * * Indeed, restaurants, hotels, and public buildings, are all testifying to the fact that I am so anxious to bring before you, that electric lighting is a decided success, for they are using it." How is that for a "*coup de grace?*" Mr. Preece is also made to say that the electric light is a luxury that must be paid for. What he said was, that at present, for household purposes, it may be a luxury, but that people would have it because it is "safe, healthy, pure, soft and natural." Moreover, as to economy: "Any comparison between gas and electricity on this basis is unfair, because gas is produced in quantities sufficient to supply hundreds of thousands of lamps, while the largest electric light station yet erected does not light up 10,000 lamps. * * * Nevertheless, the cost of supplying electricity now is far less than was the cost of supplying gas in the early days of its introduction." He might have added, in all sincerity, that in a great many places to-day the electric light is being used at a lower rate of cost than gas.

We think we have quoted enough from Mr. Preece to show that the eminent electrician is not altogether the "Daniel come to judgment" in the way that the two San Francisco papers try to make out. Mr. Preece is a man who speaks as one having authority, and not as these Californian newspaper scribes, and we are content to leave the matter to him--provided his verdict in favor of electric light shall not be mangled and twisted into the very opposite. His remarks as to bad financing have already had our warm approval, but the overreaching greed of the money-making world is no more a condemnation of the electric light than the operations of Mr. Jay Gould and Mr. James R. Keene in Western Union stock are of the electric telegraph.

As we have now briefly exposed the nature and inwardness of these attacks, a few facts with regard to the progress of electric lighting may be in order. We confess our own surprise at the advance revealed by a rapid survey of the electric lighting field. The statement of the *Alta California* that the electric light has not been a success in England, is contradicted flatly by Mr. Preece, who gives in his paper a long list of streets in London, and theatres all over the country, lit by electricity. He mentions the fact that one company is now maintaining 900 arc lamps and 5,500 incandescent lamps in different places in England, and that a new Edison central station in London, at Victoria Station, will run 5,700 lamps. He refers also to very satisfactory experiments in electric lighting on trains on the Brighton, Southwestern, Southeastern, Metropolitan, Midland and Great Northern railways, with dynamos, primary and secondary batteries, and says there is no doubt of their success. There are now also over 60 steamships afloat lighted by electricity. But this country shows the best examples of success in electric lighting, and for that reason the statements of the San Francisco papers are the more extraordinary. At the present time there are between 35 and 40 arc or incandescent lighting systems here, some existing, perhaps, only in name. Taking the systems most known, we find that there are now nearly 100 companies furnishing light under the Brush or Swan patents in different parts of this continent; and it is some time since we were informed that there were over 40,000 Brush lamps in use. The United States Company are doing an enormous business, and could probably make an equal showing of Weston and Maxim lights in use. They are about to light 20 miles of streets in Charleston, S. C. The Californian journals quoted, say that the New York authorities have no disposition to extend electric lighting in this city, but it is noticeable, on the contrary, that under the contracts awarded last month, the Brush and United States Companies have each been given additional districts here. The Thomson-Houston Company are said to have over 28,000 of their beautiful arc lights in use, and we heard last week that their business grows in a most encouraging manner. The splendid new station opened in Boston, for 1,000 of their lights, for public and private consumers, is in itself a sufficient reply to the charge that the electric light is of no use for street purposes. The Excelsior Company, well known in the East and Canada, are very actively engaged in pushing the Hochhausen system, which has of late gained considerable favor in the West. The Van Depoele Company's system enjoys immense vogue West, nineteen plants working in Chicago, while it is also the main source of public lighting in some 25 towns in Michigan, Minnesota, Indiana, Iowa, Illinois, Wisconsin and Dakota Territory. The Fuller Company have a bushel of testimonials in regard to the numerous plants they have installed all over the country. The Consolidated Electric Light Company, who lit the United Bank Building, have just made a very fine installation in the new Mutual Life Insurance building on Nassau street, of the Sawyer-Man system. The Edison Companies are doing all the business they can attend to. Their light is now in operation in thirteen towns and cities; seventy or eighty plans are in hand for other large centres of population; in New York City the demand cannot be met, 509 consumers now using about 11,000 lamps; and the isolated plants throughout the country, number 310, running 60,000 lamps.

If all this be "failure,"—done during prolonged depression in trade and commerce—we would very much like to know what the *Alta California* and its ally consider to be success. We cannot devote more of our space to the matter, but we believe that the people of the Pacific Slope will soon be put in possession of full information on electric lighting. We have had the pleasure of meeting Mr. Isaac Trumbo, of San Francisco, in this city, and know that he has been making, on behalf of his friends in the West, a thorough investigation of the subject. He will return home shortly, and will then be able to lay important data before the public, more than confirming and substantiating the few figures we have given above.

THE CONDITION OF THE PATENT OFFICE.

No sooner had the American Institute of Electrical Engineers become an accomplished fact than the members, a body of practical, earnest men, turned their attention to the disgraceful state of the Patent Office. The letter from Mr. Kintner, the Examiner of Class Electricity, intensified the indignation of the meeting in regard to the neglect of the rights of inventors. From that document it appears that inventors have paid into the National Treasury $2,500,000 over and above the expenses incurred in examining and issuing patents, and that during the past year the Bureau deposited to its credit an excess of $471,000. In spite of this, the Bureau is wretchedly housed and shamefully undermanned. To take Mr. Kintner's division alone, the state of affairs there disclosed is simply appalling. The growth of the division has been phenomenal; but there has not been the least attempt on the part of Congress to keep pace with it. Prior to July, 1880, there were less than 2,000 U. S. patents relating to electricity; now there are over 6,000 electrical patents. At this very hour Mr. Kintner is more than 600 cases behindhand; the arrears are steadily accumulating, and if an application is put in, four months at least must pass before the examiner can reach it. Inventors and capitalists know, to their cost, what is the meaning of four months' delay.

Instead of this delay there should—not alone for the benefit of those who are directly interested, but for the welfare of the whole country—be the greatest promptitude in dealing with new cases. There should also be available good digests of all the electrical patents that have been issued at home and abroad, and the salaries of the staff should be large enough to make the men look on their appointments as desirable permanencies.

The Institute begins auspiciously in striking a blow at the evils of the Patent Office.

A WALL STREET PANIC.

Wall street has fallen upon evil days, but the panic has not been half so bad as a great many persons expected it would be. The details of the recent troubles are too freshly in mind to need recapitulation. The effect of the storm is seen in our stock quotations. Western Union has had a serious tumble, going down as low as 50, but is now moving upward with briskness. Part of its recovery is doubtless attributable to the failure on Thursday of A. W. Dimock & Co. and the decline in the stock of the Bankers and Merchants' Telegraph Company, with which Mr. Dimock has been so prominently connected. As soon as the failure was announced Thursday, the stock sank like lead from 119 to 45, rallying later. The secretary of the company states, however, that the business will go on as usual, although there may be delay in extending the new lines.

The general stability of the country is seen in the composure with which the flurry in Wall street has been watched and criticised by outsiders. During the last two or three years most branches of trade have suffered and various leading firms in them have gone under, but the crisis finds them prepared and even wishful to have the worst known and left behind. We cannot refrain from

pointing out the creditable manner in which electrical interests of all kinds have passed through the prolonged ordeal of dull times, emerging from it almost without a scratch.

THE NEW INSTITUTE.

No one who attended the large and enthusiastic meeting of Tuesday evening, at the Society of Civil Engineers, could have failed to form bright hopes with regard to the new American Institute of Electrical Engineers. All branches of the electrical profession were ably represented, the interest displayed was striking, the most cordial fellow-feeling manifested itself. The mere fact that more than 260 names have been put on the roll of membership already is highly significant of success and prosperity. The ticket of officers elected is a strong one, and we look for sound direction and management of the affairs of the Institute during its infancy. Of practical work there is early promise, and we have referred to that point in another article. We understand that several gentlemen have offered to read papers before the Institute and that opportunities will soon be afforded them. A report of the meeting appears in our columns to-day.

Ocean Telegraphy.

BY WM. MAVER, JR.—PART II.

To many land telegraphists, and also to those not connected intimately with telegraphy, but who have a fair knowledge of the manner in which land lines are worked, the method by which messages are sent over the cables is a mystery, and the question is frequently asked by such persons, Are the methods employed in submarine telegraphy for the transmission of business the same as on land lines? To this I would reply that they are not; and as there appears to have been quite an interest developed lately in this subject, I shall now endeavor to describe plainly the manner of working submarine cables.

It was found early in the history of submarine telegraphy, that the detrimental effects of a certain law of electricity were so much intensified on cable circuits that unless methods could be devised to compensate for or obviate these increased detrimental effects, ocean telegraphy could not be, commercially speaking, successful.

Therefore, before proceeding to describe the different methods by which signals are commonly sent and received on submarine cables, it will be advisable to devote some time to the consideration of this law and the effects resulting therefrom; and this is rendered all the more necessary from the singular fact that the very law of electricity which principally prevents the successful operation of the cables by ordinary methods, is availed of to operate them successfully while using other methods.

This law or action of electricity is termed induction, and the effects of the law, so far, at least, as the transmission of signals through a cable is concerned, are termed "retardation" and "prolongation."

It is a well-known fact, in connection with electricity, that when a body is charged with electricity from any source whatever, that body will attract in any adjoining conducting body a certain amount of opposite electricity. That is, if the first body be charged with, say positive electricity, it will attract in an adjoining conducting body a certain amount of negative electricity.

The amount of electricity thus attracted in an adjoining conducting body will depend on the amount of electricity in the charging body, the nature of the substance that separates them, and also the distance between them.

The electricity thus attracted in the adjoining body is called induced electricity, and the action which produces it is called "induction."

We cannot interpose any substance between such bodies which will prevent "induction."

All substances, however, do not permit the inductive influence to take place through them with equal facility. Generally speaking, the least inductive effect is produced when simple air intervenes between the bodies. The greatest when India rubber, gutta percha and mica are interposed.

The facility with which substances allow this inductive influence to act through them is termed their specific inductive capacity, air being the standard. Thus, if we call the inductive capacity of air 1, the specific inductive capacity of india rubber, gutta percha, and mica, will be about 3, 4 and 5 respectively.

It will be remarked that these three latter substances are all good insulators. In fact, as a rule, all good insulators have a high inductive capacity.

In Fig. 3 let us suppose that the spheres A and B are two metal plates, supported by insulated stands.

Let A be charged with positive electricity from an electrical machine or any other source. If B be now brought close to A, it will be found that A will now take up more positive electricity, because the positive electricity on A has attracted a quantity of negative electricity on the side of B nearest A, has repelled an equal amount of positive electricity to the remote side of A, and in the effort of the two opposite electricities on A and B to unite, they have been gathered or condensed upon the sides of the spheres nearest each other.

An instrument called a condenser, much used in multiplex telegraphy and fast automatic telegraph systems, is constructed on the above principle.

It is, therefore, generally composed of sheets of tin foil connected alternately to a battery wire and to the earth, as seen in Fig. 4. Each sheet is insulated from the other by some insulating substance, preferably paraffined paper, or mica, on account of their thinness and high inductive capacity.

Supposing the lines in Fig. 4 to represent the foil, and the spaces the insulating material, the plan of the condenser will be understood. The current passing to the plates next the battery charges them, and this charge induces in the plates connected directly with the earth electricity of an opposite polarity, which in turn condenses more electricity in the battery plates, accumulating therein a charge in proportion to the strength of the battery and the number of plates in action.

If a galvanometer should be placed in the wire connecting the right hand plates to the ground, as in the figure, deflections of the needle would show that momentary currents were being induced in that wire at each make and break of the battery, or at each change of polarity of

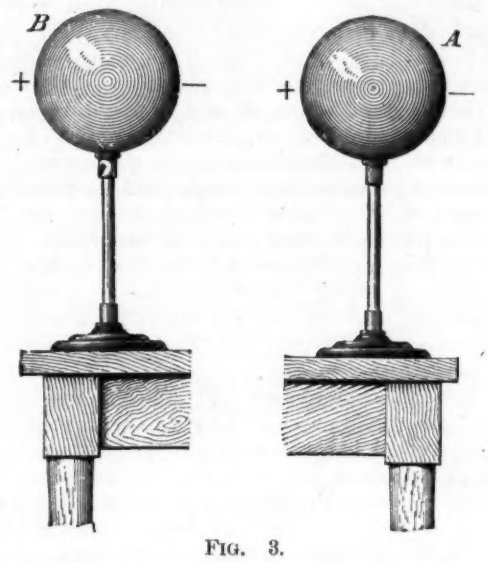
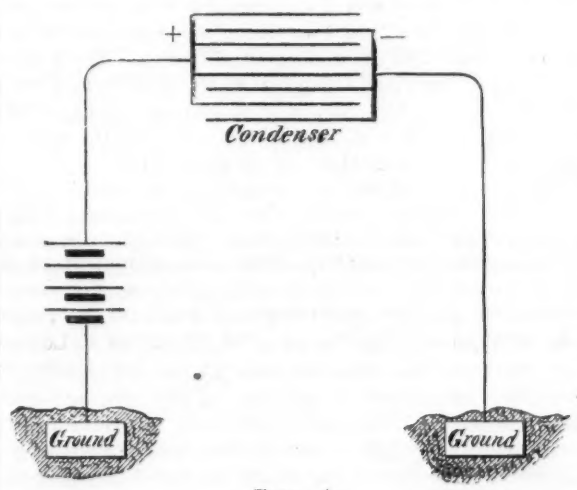


FIG. 3.

the battery. In the latter case the deflections of the needle would be to the right or left according to which pole of the battery may be presented to the plates.

Overland wires act in a measure like condensers; that is, when they are charged with electricity they tend to attract electricity in any neighboring conductors, such as wires strung on the same poles, etc. Indeed, it is quite common to be able to read messages on wires on which there may be no battery whatever, which is almost entirely the effect of induction from wires which are in connection with batteries.

The effect of induction is not, however, felt to anything like the same extent on land lines that it is on submarine



FIGR 4.

cables, for as the copper conductor of a cable is generally insulated by gutta percha, an excellent insulator, but one which, as we have seen, has a high specific inductive capacity, and as the outer coating or armor of the cable, and the water in which the cable is submerged, act as ground plates, the cable becomes in reality a huge condenser.

Thus when a cable is charged with a certain polarity it induces opposite electricity in the outer coating, and the copper conductor is enabled to take up a greater charge.

This action takes place all along the cable, one portion of it after another being acted upon; hence the full effect of the charging battery does not reach the distant end for an appreciable time.

Thus if the ordinary Morse instruments were used on the Atlantic cables, it would take about three seconds from the time of battery contact until the relay at the distant end became magnetized sufficiently to record a firm signal. This effect is called retardation. When the battery contact is broken the line discharges itself in the same comparatively slow manner; the relay therefore does not lose its magnetism for the same period of time that it required to become fully magnetized. This is called prolongation. From the joint action of retardation and prolongation, it has been found that not much over one word per minute could be transmitted by the ordinary Morse method.

(TO BE CONTINUED.)

Swift's "Practical Telegrapher."

We have received a large number of testimonials as to the high merits of Lieut. Swift's "Practical Telegrapher." The press comments have been very favorable, and we have already published the flattering comments of many operators. We now give the opinion of Mr. A. McCurdy, a prominent telegrapher at Wellington, New Zealand. He says: "'The Practical Telegrapher' was a welcome surprise. The book may be classed among the works of greatest use to operators." We add below a collection of representative opinions from the U. S. Army.

"WAR DEPARTMENT,
ADJUTANT GENERAL'S OFFICE,
WASHINGTON, Jan 9, 1884.

DEAR MR. SWIFT.—I have examined, with some care, your work on telegraphy, and beg to congratulate you on the production of so valuable a work. I doubt very much whether there is a work extant which gives so much practical information on the subject of which it treats."

Very truly yours,
(Signed) R. C. DRUM, Adjutant General.

FORT DOUGLASS, Utah, Jan. 21, 1884.

"I have your book on practical telegraphy and think it excellent."

GEO. B. WALKER,
First Lieut. Sixth U. S. Infantry.

"WASHINGTON BARRACKS,
WASHINGTON, D. C., Jan. 15, 1884.

"I have read the book through and like it very much on account of its thoroughly practical tone."

F. C. GRUGAN,
First Lieut. Second U. S. Artillery.

FORT ADAMS, R. I., January 13, 1884.

"The copy of your book came, and I was very much pleased with it. Several of the officers here have examined it and many complimentary remarks have been made about its contents. They all think it is better than anything of the kind yet published, as it contains so much new matter in such small space." R. P. STRONG,
First Lieut. Fourth U. S. Artillery.

FORT WINGATE, N. M., February 6, 1884.

I received your book, "The Practical Telegrapher," and think it is just the thing that is wanted. It is certainly practical and ought to help any one along in the business. B. H. GILMAN,
First Lieut. Thirteenth U. S. Infantry.

"FORT MONROE, Va., Feb. 10, 1884.

"Have just finished looking over your book. I think it fills the bill and will be of great assistance to a large class of beginners." ALLYN CAPRON,
First Lieut. First U. S. Artillery.

WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL OFFICER,
WASHINGTON CITY, Jan. 7.

Lieut. J. A. Swift:

DEAR SIR.—I have just finished reading your new book, "The Practical Telegrapher," and consider it the most practical work on telegraphy that I have ever read. For a beginner, it has no equal. Sincerely yours,
J. H. ROBINSON,
Chief Operator U. S. Signal Office.

The book has also, we learn, been referred to Lieut. Wallace, of the School of Application, Fort Leavenworth, Kan., for report as to its adoption in the school, and he has reported favorably on it.

The Spring Exodus.

Already the Spring exodus has attained large proportions, and among those who leave this port for Europe are several gentlemen well-known in electrical circles.

Ex-Gov. Henry Howard, who is interested in so many different electrical enterprises and is well-known among electricians, sailed for Europe on the 14th, by the steamer "Werra," accompanied by his wife and son and his son's wife. He intends staying abroad for several months. His health has not been very robust of late, but it is hoped that he will derive great benefit from the change and return home thoroughly restored. In conversation with the editor of THE ELECTRICAL WORLD, this week, he spoke of his electrical interests in a very cheerful manner.

Mr. James P. Stabler, Manager of the Stabler Individual Call Company, sails for Europe in the steamer "City of Rome," on May 17. The Stabler Call, which has been a great success here, has attracted the attention of a gentleman prominently identified with telephone interests in Europe, and while in this country he expressed a desire to have an effort made to introduce it abroad. The result of the negotiations is that Mr. Stabler goes with a view of giving a practical demonstration of the working of the instrument and of its possibilities.

As will be seen in an announcement elsewhere, the editor and publisher of this paper, Mr. W. J. Johnston, sails for Europe on May 29. He takes the steamer "State of Georgia" of the State Line. Although they go and return by different steamers, it is not unlikely that there may be a reunion in London during the summer of these and other gentlemen from this country connected with electrical interests.

As Old as Electric Bellhanging Itself.

To the Editor of The Electrical World:

SIR: I read with interest in your issue of May 3d, a communication signed "C. G. Tompkins," entitled a "New Method of Constructing Circuit of Electric Bells."

It is a good idea to thus publish any new experience which occurs to us in our technical work, and if more of our practical workers would follow the example of Mr. Tompkins in this particular, it would be well.

I have no doubt that Mr. Tompkins will be pleased to learn, even though his belief in his own priority in using the multiple-arc bell circuit be roughly displaced, that the mode in which he has connected his bells is as old as electric bell-hanging itself.

The difficulty of arranging vibrating bells serially was early met, and is stated by Prescott in his book, "The Speaking Telephone," etc., page 384, Edition of 1878; the remedy of our friend being more than hinted at on the same page.

I myself described in your columns, in 1882, the same circuit arrangement; and the said description was repeated in my book, "Practical Information for Telephonists," published by yourself in the same year.

In my later work, on "Electricity, Magnetism, and the Telegraph," page 295, it is described in detail, and illustrated by diagram,

The moral of which is, that the more we read the more we shall know. THOS. D. LOCKWOOD.

BOSTON.

Patent No. 282,016.

To the Editor of The Electrical World:

SIR: Referring to letter of Mr. C. G. Tompkins in your issue of May 3, I would respectfully refer him and all others interested, to Patent No. 282,016, issued in July, 1883, wherein is embodied the system referred to. It is now nearly three years since I discovered and applied the system of ringing two or more bells in one circuit from one circuit and one push button. When the principle on which the bells ring—circuit being opened at each bell when battery is applied—is understood, it can readily be seen that the item of resistance of coils will not affect their ringing, provided there is battery enough to affect the heaviest resistance in the circuit. My experience is that a small resistance and quick-acting or light-adjusted bell is best. H. H. JOHNSON.

May 14.

Not New.

To the Editor of The Electrical World:

SIR: Mr. C. G. Tompkins' communication in regard to method of constructing circuit of electrical gongs is not new, as he claims. I have constructed the circuit he describes, of any number of vibrating gongs, all to run from one battery and one push button, ten or twelve years ago, and have put up quite a number of them since, and all of them have given good satisfaction. His theory of the circuit is correct. LOUIS DERRICK.

BROOKLYN, May 6.

In Use Over Six Years.

To the Editor of The Electrical World:

SIR: Mr. C. G. Tompkins' new method is rather old in this section, it having been in use in Philadelphia, Pa., over six years. The same number can be worked on a continuous circuit by using one vibrator and the balance single top, making all vibrators while ringing. Give us something new. C. C. DRAKE.

TRENTON, May 5.

The Telephone in the West.

The men to whom the interests of the telephone have been committed in the West appear to be most active in developing their territory. The following from the Butte, Mon., *Miner*, of May 3, tells of progress in that remote region:

Mr. C. F. Annett, general manager of the Rocky Mountain Bell Telephone Company, with headquarters at Salt Lake City, arrived in Butte yesterday. In the course of a conversation with the gentleman a reporter gained the following interesting items of information. It is the intention of Mr. Annett to connect all the principal points in Montana by telephone. He has purchased the military telegraph line from Helena to Missoula, and has now a force of workmen on the line repairing it and putting it in shape for use. The line will be in working order in a few days.

A line will also be constructed from Butte to Missoula and be ready for business by the first of next month. It is also the intention of Mr. Annett to construct a line from this city to Anaconda. He proposes to build the line and a central office in Anaconda if the citizens here and at the former place will subscribe $1,500 towards the enterprise. Those subscribing will be entitled to scrip to the amount of their subscription, which scrip will be taken in payment of telephone messages. Mr. Annett feels confident that the subscriptions will be forthcoming and that work will be commenced upon the line at an early date. A line between the two places will be of great advantage to our business men here who have branch houses at the young and growing town. Mr. Annett is thoroughly acquainted with all the details of telephoning and telephone building and proposes to give every place of importance in the Territory an opportunity to enjoy its full benefits.

Telephone rates in Butte will be reduced to $5 per month for business places and to $4 per month for family residences. The reduction will be made this month.

Conductivity of Copper.

The true nature of electrical resistance is by no means well known; and the only light which the induction balance of Professor Hughes has as yet shed upon it has not revealed its true nature. An interesting observation recently made by Mr. W. Groves, the well-known electrician, deserves, says *Engineering*, to be more widely known. Mr. Groves took thin discs of brass and coated them by electro-deposition with a thick layer of pure crystalline copper. He then cut similar discs of copper from the deposit and tested them in the induction balance. The scale gave 200 as their induction value. The same discs, after being melted in a founder's furnace, only gave 100 on the scale, and after a second melting their induction value had fallen to nearly that of ordinary sheet copper, namely from 50 deg. to 80 deg. If, as many believe, the induction value represents the conductivity of the copper, there is here a great falling off, and it might be valuable not only in a theoretical but, practical sense, to find out the true cause. Dr. Mathiessen found that copper lost in conductivity by absorption of oxygen, and the pure copper being fused in an ordinary founder's furnace may have lost its electric conducting power by absorption of this impurity. Should that prove to be the case, there is much to be gained by fusing copper in presence of hydrogen, which uniting with the oxygen would form water, and leave the copper in its pure condition. To ascertain this it will be necessary to call in the aid of chemistry and analyze the copper so treated. Mr. Grove's experiment is interesting as opening up a field for further investigation. Should the effect in question not be traceable to the absorption of oxygen, it may be due to the molecular structure of the copper in the three cases mentioned, the crystalline structure of the first case being more conductive than the molten structure in the other two cases.

He Forgot to Put in the Wires.

One or two good stories come from Washington, anent the laying of underground cables there:

The Bankers & Merchants' Telegraph Company in this city are putting their wires under ground. The other day they made a discovery that was amusing to others, but not to the man having in charge the underground work. He had completed the work for four squares when a thought struck him. He was very sorry that he had not been struck by it before. He had made the underground receptacle for the wires and covered it over according to the most approved methods, but he had neglected to put in the wires or anything by which they could be pulled through. He tried air pressure and everything he could devise to force a wire through the underground trough. But nothing availed. The whole thing had to be taken up and the work done over again. Mr. Morrill Marean, manager of the Washington office of the Western Union Company, told a *Critic* man about this. He continued:

"It reminds me of the time they had in London in 1857 or '58. The telegraph wires in that city have always, for the greater part, been under ground. The main wires are laid through the big tunnels, which accommodate also the gas and sewer pipes. These tunnels are big enough for a man to walk through easily. Of course there is no trouble about inspecting the wires or repairing or replacing them, whenever it becomes necessary. But the pipes containing the lateral wires, running off for two or three miles from the main line, are small ones. At the time of which I speak one of these lateral wires was hauled out to be repaired. The men doing this work failed to attach to it a leading line, by which the wire could be drawn through again. The means employed to correct the error were very unique. A large rat, with a fine steel wire, was put in the pipe. Behind there was thrust a ferret. The rat ran from the ferret a short distance and stopped. It was feared that he would show fight and be killed. But he started on again. He ran through the whole length of the pipe and brought out the wire in good style, though closely pushed by the ferret."

A DIRTY TRICK.—An outrage was committed at Elgin, Ill., on April 29, by some one who evidently owes the electric light company there a grudge. Suddenly on that night the places using the light were plunged into darkness. When a hunt for the cause of the accident was made next day, it was found that at a point where three wires were run, a piece of ordinary telegraph wire had been carefully placed over the two outer and under the center wire, the insulating cover being first cut through. This, of course, cut off the circuit and turned the entire electric current back into the dynamo, causing all the damage. Had not prompt action been taken, much valuable machinery would have been ruined. Fortunately for the tower lights, the contact was not perfect with the center wire, and it was not cut off. The force of the electric current was such that the thick telegraph wire was melted and bent at right angles. Mr. G. S. Bowen, the president of the company, has offered a reward of $100 for information leading to the conviction of the guilty party.

DEPARTMENT OF INQUIRIES.

While we are pleased to answer in this department all questions of general interest to our readers, and do so without charge for time or expense, we must request those of our patrons who desire information for their personal interest, and who cannot be properly answered in this way, to send us with their request a small sum, say from $1 to $5, to pay for the time and the expense incurred for their exclusive benefit.

56.—ELECTRICITY.

"What are the physical and chemical properties and appearance (if it has any) of electricity." O. S. F.

INDEPENDENCE, W. Va.

As electricity is not a substance, it has no physical nor chemical properties, and cannot be seen as such. It is a mode of motion of matter, or a manifestation of the existence of energy in matter. Read up on the subject. See our list of books, and the series of articles now appearing in these columns on "Electrical information for beginners."

57.—ARC-LIGHT CARBONS.

"What relation has resistance to hardness in electric light carbons? Do short-arc lamps always require harder carbons than long-arc lamps?" CARBON.

EXETER, N. H.

Other things, such as quality and size, being equal, hard carbons have less resistance than soft, and therefore are better for both kinds of arcs, because they last longer. Soft carbons are better for weak currents than are hard ones. The arc seems to be steadier with them.

58.—TO MAKE POWDERED CARBON COHERENT.

"Will you tell me what is mixed with powdered carbon to make it an adhesive mass to mold?" W. W. S.

BRADFORD, Pa.

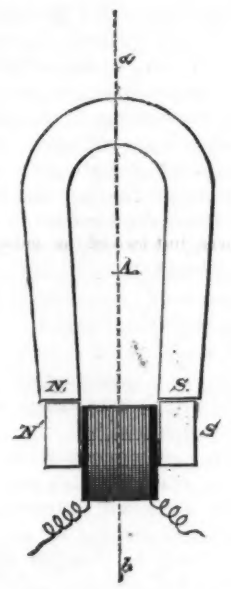
Molasses, a solution of sugar, tar and like hydro-carbons are used for the purpose. Generally the mass is submitted to a red-heat thereafter, in receptacles which are air-tight, or otherwise protective of the mass from access of the atmosphere. The heat decomposes the hydro-carbons, expelling the hydrogen and leaving the carbon behind as a cement for the particles of powdered carbon.

59.—DEMAGNETIZING PERMANENT MAGNETS.

Is there any known method by which a permanent magnet may be demagnetized without heating? H. G. P.

SAN FRANCISCO, Cal.

The best way to demagnetize a bar permanent magnet is to suspend it by a string around its middle, so that it will



hang horizontally, near an electro-magnet stronger than the permanent one; and then, while twirling the magnet, cause it to slowly recede from the pole of the electro-magnet. This latter must be strong enough to reverse the magnetism of the former. As the permanent magnet rotates and recedes, its polarity is continually reversed, and, with each reversal, decreased in strength, until reduced to the minimum at the limits of the perceptible magnetic field of the electro-magnet.

Demagnetization of a horseshoe magnet is not so easily effected, but we would suggest trying the following: Place the horse-shoe magnet *A* as shown in the figure, and the electro-magnet *B* so that the magnet *A* may be rotated on the line *a b*. Rotate the magnet and cause it slowly to recede on the line *a b* until its field is withdrawn from the poles *N S*. Magnetized watches may be similarly suspended near a magnetic pole, and withdrawn slowly, to demagnetize them. Try the following: Surround the permanent magnet poles by solenoids, and pass current through them of strength sufficient to reverse the magnetism of the magnet; then rapidly reverse the direction of the current while progressively decreasing its strength. See next week's issue for more on this subject.

THE TELEGRAPH.

THE BENNETT-MACKAY CABLE.—The steamer "Faraday" is busy laying the American ends of the new cable, and reports the outlook very favorable.

POLE TAPPING.—This appears in *Harper's Weekly:* A New Jersey man tapped some telegraph poles to obtain "sap for the coming camp-meeting to drink," as he expressed it. Watering telegraph stock has not been carried quite to the extent which would make this man's industry remunerative.

CROSSED WIRES.—The crossing of telegraph and telephone wires with the Police and Fire Alarm wires in Philadelphia, has led to a general order in that city requiring all the companies to remove their lines so as to leave them at least four feet above those of the city's own plant, on pain of having them cut.

THE B. & O. AT WORK.—The large force of workmen who invaded Second avenue last week, have been putting up telegraph poles from Twenty-seventh street down the avenue to Houston street, and through other streets as far down as Catharine street. The poles are erected by the Baltimore & Ohio Railroad Company. They overtop the other telegraph poles on the avenue, and are placed equidistant between the old poles.

UNDERGROUND WIRES.—Printed petitions asking Gov. Cleveland to approve and sign the bill recently passed by both chambers of the New York Legislature, which requires that all telegraph poles in the city streets be abolished, and that telephone, telegraph and electric wires be laid underground, were extensively circulated on the 15th, all over the city, and received such signatures as that of Lord & Taylor and Tiffany & Co. The petitions will go to the Governor to-day.

CABLES UNDERGROUND IN WASHINGTON.—The Chesapeake & Potomac Company have been laying a line of cables on Fifteenth street through to Vermont avenue, and down Vermont avenue to Fifteenth street, and thence to the exchange of the company. The line will be completed in about ten days. The Postal Telegraph Company is laying a cable on Fourteenth street and Pennsylvania avenue. The cable will be laid out on Fourteenth street to the boundary, where it will connect with the company's wires running into the city.

GULF OF ST. LAWRENCE SIGNAL SERVICE.—The question of the Gulf telegraphic service is still the subject of discussion among Dominion shipping firms, says the Montreal *Witness*. It is generally felt that as the Government has spent $200,000 in establishing the Gulf telegraphic service, and as the signal service stations are officered with men who have little or nothing to do but furnish information, hourly if necessary, that the service should be correspondingly good. Instead of that, the service has been unprecedentedly bad at the very time it has been most needed. During Spring a great deal of floating ice is shifting about the Gulf and a passage through it can only be sought with any chance of finding it by knowing where it is and watching the winds. The Government has, it is reported, promised that the signal service will be revived and that reports will be furnished each station and Quebec and Montreal from all the stations at least twice a day.

THE TELEPHONE.

AN INSTRUMENT OF RUSSIAN TORTURE.—A despatch from St. Petersburg on the 10th inst., says that the Russian Government is placing telephones in all the fortresses in the country. Judging by the way in which some of the circuits are worked here, the Russians could hardly find a worse instrument of torture.

SCORCHED BY LIGHTNING.—A severe thunderstorm visited Winnipeg, Man., on May 4. The lightning struck the telephone wires, burned off the insulation of nearly all the 350 wires leading into the exchange, and set fire to the inside of the roof of the cupola. In the operating room the wires had been disconnected, and nobody was hurt there, but two of the ladies at work were badly frightened. The damage amounted to about $300.

THE TELEPHONE IN CONNECTICUT.—The annual meeting of the Southern New England Telephone Company was held at New Haven, Conn., on the 13th. The report for the business year closing with March, 1884, shows that there are in the company's system, 5,615 stations, with 36 exchanges, an increase during the year of 1,021 stations. Value of the plant, $1,166,948; cash receipts, $284,712; expenses, $149,500; dividends paid $88,476. The relations with the American Bell Telephone Company are the same as during the previous year, no contract between the two companies having been executed yet, and with no indications of a consolidation of interests. The following directors were elected: Morris F. Tyler, Wilbur F. Day, H. P. Frost, Chas. P. Mitchell, of New Haven, and Lyman B. Jewett, of Hartford. Morris F. Tyler was elected president.

THE WISCONSIN TELEPHONE CO.—A general directory of Milwaukee subscribers and the exchanges connected with Milwaukee, corrected up to date, has been issued by the above company, whose officers are C. H. Haskins, president; F. C. Bigelow, treasurer; H. C. Haskins, Secretary; G. E. Knight, Manager, Milwaukee Exchange; A. S. Hibbard, Superintendent State exchanges; W. B. Roberts, Auditor, and S. G. Lapham, Cashier. The company have now in operation more than 1,200 miles of toll line, and their Milwaukee subscribers can carry on conversation with over 5,000 subscribers in fifty exchanges outside that city, with 2,500 people at 150 toll stations in the county, and with 1,200 subscribers in Milwaukee itself. The number of connections has risen already to over 7,000 daily. The directory is a massive publication, and the company have our heartiest congratulations on its appearance.

TESTING ANOTHER MECHANICAL TELEPHONE.—The Boston *Star* says: "A number of gentlemen, this morning, witnessed the working of a new telephone at a private exhibition given in this city. It is of the type known as a mechanical telephone, and is noted for distinct articulation and volume of sound, especially that of the human voice. A whisper is heard as distinctly as the ordinary conversation, over the telephone now in use. Ordinary conversation was carried on twenty feet away from the instrument with ease. One gentleman stood a distance of 40 feet from the telephone, and by slightly raising his voice was distinctly heard at the other end of the line, the distance being from Milk street to State street. This telephone is intended by its projectors to take the place of all others on lines of distances of less than five miles, at about one-half the cost at present paid for the service. The inventors are A. A. Knudson and T. G. Ellsworth, electrical and mechanical experts, of New York. Local companies are being formed throughout the United States. Mr. Charles F. Hollis and C. H. North, of this city, are general agents for New England." Mr. John F. Augustus is the general agent for the United States.

THE ELECTRIC LIGHT.

RACINE, WIS.—The Fuller Electric Light Co. of Chicago have asked permission of the City Council of Racine, Wis., to erect lines and poles for a plant to cost $30,000

WHERE THE LIGHTNING STRUCK.—When people like the electric-light and coal-gas advocates get to quarreling over the respective merits of their lights, it is kind of discouraging to one party to have Providence and the elements take sides with its opponent. In Philadelphia, last Friday night, a bolt of lightning struck a lamp-post at Inquirer and Parrish streets, and shattered it all to pieces.

DETROIT, MICH.—An ordinance granting the privilege of erecting poles and wires to the Excelsior Electric Company, of Detroit, was adopted by the Common Council on Friday night, 9th inst. The company is preparing a central station for a plant of 300 arc lights. The officers of the company are O. W. Shipman, President; Thomas S. Christie, Vice-President; A. P. T. Beniteau, Secretary; Moses W. Field, Treasurer.

U. S. CO., WASHINGTON.—Mr. Samuel Norment has been elected President of the United States Electric Lighting Co., Washington, *vice* James L. Barbour, resigned, a meeting of the board of trustees having been held for this purpose and to declare a dividend out of the profits for the last six months. Other changes in the board are pending, and Mr. Norment's installation as President indicates capable and thorough management of the affairs of the company.

TAKING PHOTOGRAPHS WITH ONE LAMP.—Mr. G. H. Sherman, of Elgir, Ill., has been taking excellent photographs with the aid of the arc light, using one lamp only. We have seen some of the photographs, of which the negatives were taken in twenty seconds, and find them to be admirable pieces of work. The State Photographers' Association of Illinois is to visit Elgin and examine Mr. Sherman's methods there, on invitation of Mr. G. S. Bowen, President of the Elgin Electric Light Co.

PORT HURON, MICH.—The Excelsior Electric Light Company, of Port Huron, has filed its articles of incorporation. Its capital stock is $25,000. The incorporators and stockholders are Henry Howard, Henry McMorran, C. F. Harrington, O'Brien J. Atkinson, of Port Huron, and A. P. T. Beniteau, of Detroit. An ordinance has been adopted giving the company the exclusive right to erect poles and wires through the streets of the city for twenty years. A fifty-light station will be commenced at once.

THE BERNSTEIN LAMP.—The Bernstein Electric Light Manufacturing Co. is continuing its quiet course in perfecting every part of its system, which, according to all reports, seems to contain features of an entirely novel character. It may appear somewhat singular that the Bernstein lamp should be largely in use in different parts of Europe, while very little of it is seen in this country as yet, but we are assured at the company's office that the development of the European business is the very reason of the delay here.

MEASURING THE INTENSITY.—An ingenious method for measuring the intensity of the light of electric lamps, by which the necessity for placing them at a great distance from the standard candle is avoided, has been devised, says *Mechanics*, by Dr. Hammerl, who interposes a revolving disc in which are cut out sectors between the lamp and the screen, allowing only a portion of the rays to pass. For instance, if the sum of the angles of the sectors be 180°, half the light will be intercepted. It has been found that three sectors are sufficient to give a uniform light with a moderate speed of rotation. Consequently, to reduce the light to a third, three sectors of 40° are employed. With three sectors of 12°, the light is reduced to one-tenth of its actual power. By employing two discs, each provided with three sectors of 60°, cut out and arranged one behind the other on the same axis, they may be made to give as great a reduction of luminosity as may be desired.

ELECTRIC LIGHTING IN BROOKLYN, L. I.—The Brooklyn Board of Aldermen have rescinded a resolution passed a week ago giving two electric light companies the privilege to erect polls and wires in the eastern and western districts of the city. The resolution was rescinded at the suggestion of Mayor Low, and the same general privileges have been accorded the companies in another resolution, which, however, contains terms much more advantageous to the city. Each company is to furnish free to the city four lights, each of 2,000 candle-power, and one light free for every 30 furnished to private consumers. Lights furnished to the city shall be charged for at the rate not to exceed 70 cents a night for those of 2,000 candle-power, and not to exceed 15 cents per light for those of 16 candle-power. The companies also bind themselves to furnish 2,000 candle-power lights to private consumers at a price not exceeding 75 cents a light and 15 cents for 16 candle lights.

MISCELLANEOUS NOTES.

ELECTRICAL JOURNALISM.—Two new electrical papers have recently appeared on this side of the Atlantic, the *Canadian Electrical News*, of Montreal, and *The Electrical Era*, of Philadelphia. The former is edited by Mr. J. Howe, who has long aspired to this kind of work. He makes up a newsy paper of eight pages, for which there ought to be plenty of elbow-room and patronage in the Dominion. The other paper is managed by Mr. G. M. Wallace, and appears to build its hopes on the approaching exhibition. It is popularly written and printed in large type.

NOTES FROM AN OLD MAGAZINE.—A gentleman in Philadelphia has a volume of the *Gentleman's Magazine* for 1753, in which some very quaint and curious information is given about this country. The last issue of the year 1753 devotes considerable space to the proceedings of the meeting of the Royal Society in London, at which "a gold medal was adjudged to Benjamin Franklin, Esq., of Phila. (not Maryland, as mentioned in our last magazine), for his useful discoveries in electricity. On this occasion the Earl of Macclesfield delivered a speech which greatly enhances the value of the prize and does honor to the judgment, candour and strict impartiality of the society."

ALUMINUM WIRE.—Prof. Jamieson, of Glasgow, has been testing some aluminum wire. On analysis, the wire gave 98.39 per cent. of aluminum, 1.24 per cent. of iron, and 0.37 per cent. of silicon, the specific gravity being 2.786. As the wire was only in short lengths, he had been compelled to determine the electrical resistance of the metal by the "fall of potential" method with chemically pure copper wire as well as with a standard B.A. unit; and he had found that the aluminum had 1.96 times the resistance of the copper wire of the same gauge and length, and but little more than half the resistance of pure copper for the same length and weight. The introduction of a small percentage of aluminum into copper increased the tensile strength and electrical resistance of the latter immensely.

THE VALUE OF ELECTRIC RAILWAY SIGNALS.—Railway Commissioner Henry Staples, of Rhode Island, in his annual report for 1883, says the *Elevated Railway Journal*, dwells at length on the electric signal and block system of the Union Switch and Signal Company as used on the Providence & Worcester road. He said that in his two previous reports reference was made to the system of electric signals as operated by the Providence & Worcester. It seemed to be a matter of such vital importance to railroad interests as to warrant material expenditures for practical tests. After practically testing them, almost step by step, they have proved so completely and so thoroughly satisfactory that they now cover their entire road. Superintendent Chamberlain, in answer to a note of inquiry from the commissioner, made a report comprehensive and exhaustive. He bestowed therein upon the system the following encomium: "Not only our entire railroad interests, but our whole community, owe a debt of deep gratitude to this corporation, and to their zealous and efficient superintendent, for the trial and adoption of this electric signal. It does seem as if we had reached that era when it is utterly impossible to have railroad accidents. To be sure bridges may give way under the pressure of heavy loaded trains, or wheels or axles of cars may break, but barring carelessness of employés by their non-attendance to their written instructions, collisions are utterly impossible—the danger from a broken rail is announced before it is discovered—danger from misplaced switches are avoided, and all grade crossings are carefully guarded. To obtain such a result as this system of signals has developed, much time has been consumed, much patience exhausted, and withal much money required, but the result has fully repaid for all. Such a system in operation over our entire State would wonderfully add to the protection of life and limb while traveling in the cars and also to safety at all grade crossings."

STOCK QUOTATIONS.

Telegraph, telephone and electric light stocks were quoted as follows on Thursday at the Electric, Manufacturing and Miscellaneous Stock Exchange, and at the Stock Exchange:

TELEGRAPH.—American Rapid, b 50, a 65; Commercial Telegram Company Pref'd, a 109; Commercial Telegram Common, a 95; Harlem District Telegraph Co., b 2, a 2.50; Manhattan Telegraph, b 10, a 85; Mexican, b 125, a 147; Northern & Southern Tel. Co. 1st mtge bonds, b 74, a 78; Postal Telegraph & Cable Co., b 12, a 13.50; Am. Cable, a 50; B. & M. Co., b 45¼; Mutual Union, b 10, a 10½; Western Union, b 52⅝, a 52¾.

The panic in Wall street this week, carrying down several large firms, has had a marked influence on electrical stock. Western Union, that reached 94 in 1881, was sold at 50, but has since recovered slightly. The most remarkable drop was in Bankers & Merchants', which fell to 45½ on Thursday from 119 the day before, owing to the suspension of A. W. Dimock & Co., referred to more fully in our news columns.

TELEPHONE.—American Bell, a 146; American Speaking, b 110, a 125; Currier Telephone Bell, b 3; Columbia and Panama, b 24 50, a 25; Continental, b 15; Dolbear, b 5, a 10; Hudson River, b 60, a 90; Inter-Continental, b 95, a 1.25; Mexican, b 2.50, a 3.25; Mexican Central, a 2.50; Molecular, b 7, a 13; New York, a 85; New York and New Jersey, a 80; New York and Pennsylvania, b 50, a 80; New York State Overland, b 15, a 20; Overland, b 10, a 15; People's, b 10.50, a 12; People's (N. E.), b 1.50; Shaw, b 20; Solenoid, a 90; Southern Bell, b 95, a 125; Southern New England, a 175; Tropical, b 2, a 2.50.

The Boston *Herald* of May 15, thus reports the local market: "Bell Telephone felt the break keenly. It was firm at 156 last night, opened at 154½, sold down to 141, and reacted quickly to 146@145. Mexican Telephone settled away to 2, Erie to 25½, with later sales at 26. New England sold at 28, and Tropical at 2⅛."

The New England company made a net gain of 130 subscribers in April. The annual meeting of the Erie company occurs at Albany, N. Y., on Monday, June 9, at which time the vacancy in the board of directors caused by the death of Hon. Charles R. McLean will be filled.

The Southern New England company report having paid $88,476 dividends last financial year.

ELECTRIC LIGHT.—American, b 2, a 4; Baxter, b 22, a 23; Brush, b 50, a 80; Brush Illuminating, b 45, a 70; Daft, a 90; Edison, b 90, a 100; Edison Illuminating, b 55, a 75; Edison Isolated, a 90; Edison European, b 8, a 15; Excelsior, b 20; Swan Incandescent, b 15, a 40; United States, b 75, a 95; United States Ill. Co., a 90.

Kohlsaat & Co., No. 30 Pine street, furnish the following quotations for miscellaneous securities:

	About.		About.
Daft Electric Illum.....	85	Am. Bell Telephone.....	159
Edison Electric.....	100	Mexican Telephone.....	21
Edison Illuminating.....	60	Peoples Tele.....	23
Edison Isolated.....	75	N. Y. & N. J. Tele.....	63
U. S. Electric Light.....	95		

BUSINESS NOTICES.

MR. R. G. ANDERSON, of the firm of Metcalf & Anderson, has accepted a position at Scranton, Pa., with one of the steam-engine manufacturers there. Mr. Wallace Metcalf will continue the business built up by himself and his late partner as mechanical electrical engineers and draughtsmen.

THE ELECTRIC GAS LIGHTING CO., of Boston, Mass., makes an important announcement in our advertising columns to sellers and users of electric gas-lighting apparatus. This wideawake concern is now supplying its customers with elegant and perfect goods of its own manufacture. Dealers will do well to investigate the special claims of this company to their patronage.

POSITIONS WANTED.—We direct attention to the two advertisements for positions, appearing in this issue. The qualifications in each case are high, and we shall be glad to hear that the advertisers have secured good openings. One of the gentlemen has had several years' training with Siemens & Halske, and the other, a college graduate, has had 3 years' experience in electrical work.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

Edited by N. S. KEITH, Electrical Engineer and Expert, 9 Murray Street, New York.

PATENTS DATED APRIL 29, 1884.

Apparatus for the Production and Utilization of Secondary Electric Currents; Lucien Gaulard and John Dixon Gibbs, of London, England.... 297,924

A primary circuit of any length has parallel insulated wires made up with it into a cable. This cable is made into a coil surrounding a core consisting of a bundle of iron wires. Any number of these so constructed secondary generators have their primaries connected in series with a generator of alternating currents of constant current strength. The parallel wires constitute secondary circuits which may be connected up in series or in parallel, according to the effects desired from them.

Apparatus for Electroplating; Charles F. Brush, of Cleveland, O. 297,669

This is used in copperplating electric-arc-light carbons. Each carbon has an anode of copper concentrically surrounding it, so that the deposit may be made uniformly. Each carbon and its copper constitute the single pair of electrodes of a bath. Several baths are connected up in series.

Commutator and Brush for Electric Motors and Generators; Elmer A. Sperry, of Chicago, Ill. 297,867

To obviate injury to brushes from reversal of the direction of rotation of dynamos or motors, there is provided two pairs of brushes, those of one pair being inclined toward the commutator in direction opposite to the inclination of the other pair. These two pairs are connected by automatically working devices which operate to put into contact with the commutator that pair of brushes which has the inclination suitable to the direction of rotation, and to put out of contact the other pair.

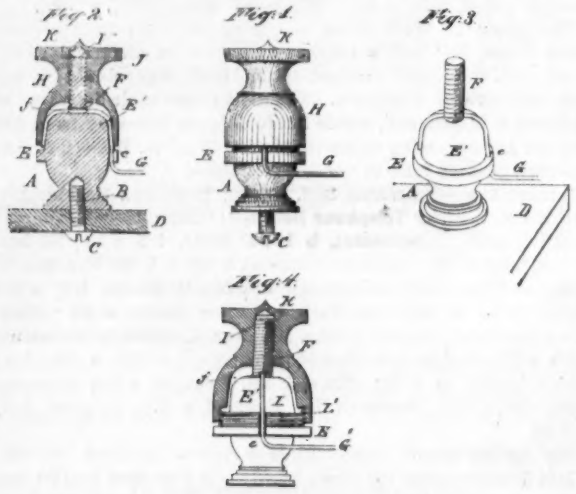
Combined Electric Lamp-Lighting and Extinguishing Device; Henry Van Hoevenbergh, Elizabeth, N. J..... 297,879

The wick is ignited by a current passing a fine platinum wire at the wick. The light is extinguished by a blast from a bellows through a pipe and nozzle into the top of the lamp-chimney. This apparatus is operated by a pull-cord. A slight pull closes the electric circuit in which is the platinum wire and lights the lamp. A strong pull moves the nozzle over the chimney and compresses the bellows, so that air is forced into the chimney to blow out the light.

Binding Post; Thomas R. Abernethy, of Chicago, Ill..... 297,655

A is the base of the post, provided with a screw-threaded perforation *B*, adapted and arranged to engage with a screw, *C*, for securing the device to a board, table, or other support, *D*.

E is a shoulder formed upon the base, slotted at *e* for the passage of the conducting-wire, the upper portion, *E'*, of the base being conical or sugar-loaf in shape, as plainly shown.



F is a screw-threaded projection extending from the base, said projection being perforated at *f* for the passage of the conducting-wire *G*.

H is a cap-piece, the lower surface or interior whereof corresponds in shape to the upper portion, *E'*, of the base *A*, a female screw, *J*, engaging with the projection *F*. The top *K* of the cap is milled or roughened to facilitate manipulation.

Conduit for Electric Wires; Christian H. Goebel, of Philadelphia, Pa., Assignor to the Goebel Sectional Electric Underground and Pneumatic Delivery Company of N. J..... 297,927

Consists of a conduit for electric wires provided with a coupling whose joints are close and tight, so that water is prevented from entering.

Dynamo-Electric Machine; Thomas A. Edison, of Menlo Park, N. J..... 297,584

Improvements in details of brushes and brush-holders. The brushes are composed of alternate layers of metal ribbons and wires.

Device for Attaching Telegraph Wires to Posts and Insulating them therefrom; Herbert Cottrell, of Newark, N. J.... 297,677

A screw-hook adapted to receive a divided block of insulating material. The block is perforated to receive the conducting wire.

Dynamo-Electric Machine; Thomas A. Edison, of Menlo Park, N. J..... 297,583

A spring and bearing-piece is placed against each end of the shaft, so that in running, the shaft may be allowed to move a little longitudinally, either way, but resume at once its normal balanced position.

Dynamo-Electric Machine; Thomas A. Edison, of Menlo Park, N. J..... 297,587

The portion of the pulley near the field-magnet poles is made of a non-magnetic material. A spring-bearing at the end of the shaft opposite the pulley balances the attraction of magnet for pulley.

Dynamo-Electric Machine; Charles J. Van Depoele, of Chicago, Ill..... 297,878

The armature-core is made up of longitudinal iron-bars and wire-rings within and without the bars. The bobbins are wound as in the Gramme armature, except that the wire of each bobbin is looped at the middle, and the loop taken to a segment of the commutator. So there are twice the number of segments as there are bobbins. The wrought-iron bars of the field-magnets are placed in a mold and cast-iron is poured in to join them in place.

Dynamo-Electric Machine; Thomas A. Edison, of Menlo Park, N. J., Assignor to the Edison Electric Light Co., of New York, N. Y..... 297,582

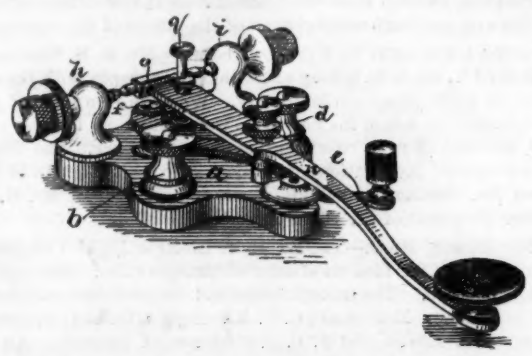
In making up the core of the armature several thicker discs are interspaced with the other discs. These thicker ones are provided with a suitable number of slots or notches in their peripheries, and into each of these notches is slipped a thin piece of insulating material. These pieces project radially between the coils of wire on the core, and keep the wires from being drawn circumferentially out of place.

Electric-Arc Lamp; Philip P. Nungesser, of Cleveland, O..... 297,833

Various details of an electric lamp.

Telegraph Key; Charles W. Lewis, Assignor to the Western Electric Co., of same place..... 297,819

In the operation of this key the lever, being centred at its extreme end, and being constructed of flexible material, will, when pressed down, yield or bend upward slightly between the



point where it is centred and the contact-points after said contact-points are brought together. This upward yielding or bending of the lever at this point draws the upper contact-point, *t*, toward the centres *k l*, and thus produces a slight rubbing between the contact-points, which prevents "sticking" and insures a better electrical connection.

Electrical Conductor; Thomas A. Edison, of Menlo Park, N. J..... 297,586

The conducting wire is covered by strips of parchment paper wound spirally thereon and retained in place by a cover of fibrous material.

Electric Regulator; Elmer A. Sperry, of Chicago, Ill..... 297,866

Electro-magnets open or close valves controlling the flow of a fluid into or out of a reservoir. The consequent changes in weight of reservoir serve to operate devices for various purposes, but mainly for regulating the electric current from dynamos.

Electric Cable; William H. Sawyer, of Providence, R. I..... 297,855

A fine wire electric cable in which, upon a central heavy wire and insulated therefrom, are a series of fine covered wires and a series of fibrous threads braided together, the wires running spirally in one direction and the threads in opposite directions.

Electric Arc Light; Thomas A. Edison, of Menlo Park, N. J., Assignor to the Edison Electric Light Co., of New York, N. Y..... 267,580

The main-circuit solenoid and the shunt-circuit solenoid are made of the same resistance, but of different sizes and lengths of wires. A resistance shunt is placed around the main-circuit solenoid.

Electric Cut-Off; Christian H. Goebel, of Philadelphia, Pa., Assignor to the Goebel Sectional Electric Underground and Pneumatic Delivery Co. of N. J..... 297,928

A contact finger is provided for each incoming and outgoing wire. The fingers are operated simultaneously by reason of toothed segments attached to the fingers and gearing together. They may by a key fitting the axle of one be placed in contact with one plate or be moved to connect with the wires of a branch circuit.

Electric Door-Opener; Jesse H. Bunnell, of Brooklyn, N. Y..... 297,751

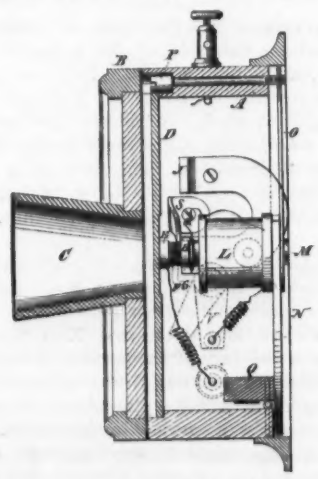
A device which may be brought into action from one or more different points throughout a building—such as an apartment-house—to release the retaining-plate of the door-latch by means of an electro-magnet, and to cause the closing of the door to place the device in such position that the latch-plate, when so released by the electro-magnet, will be automatically withdrawn from the latch, thereby relieving the electro-magnet from the necessity of accomplishing other work than that of merely releasing the latch-plate.

Telephone Transmitter; Daniel Drawbaugh, of Eberly's Mills, Pa., Assignor to the People's Telephone Co., of New York..... 297,579

A is the box or case of the instrument.

B is the outer cover, containing the mouth-piece *C*. The cover *B* is shown in the form of a door hinged to the case *A*.

D is the diaphragm, to the centre of which is attached in any



convenient way a small metal cup *E*, holding an electrode *F*. The second electrode *G*, is held in a similar metal cup *H*, riveted or otherwise secured to the end of a flat spring *I*, of conducting material. The spring *I* has the greater part of its length in contact with, and is suitably secured to, the permanent magnet *J*. The free end of the spring *I* is disposed in front of one end of the soft-iron core *K* of the electro-magnet *L*. The other end of the core *K* is held by means of a screw *M*, in close contact with one pole of the bent permanent magnet *N*; also connected to the same pole of the permanent magnet *N* is a bar *O*, of brass or other conducting material, the other end of which is connected to the case *A* of the instrument by means of an adjusting-screw *P*. The electro-magnet *L* is in fact an induction-coil having a primary wire, to which the local-battery circuit passes, and a secondary wire, which collects the induced currents and conducts them to the line.

Gaso-Electric Lamp; Johan Hern Loder, of Brussels, Belgium..... 297,820

A lamp in which the light is obtained not only from the gas-flame, but also from carbon, graphite, or other suitable pencils, which are placed in or in close proximity to the gas-flame, and become heated thereby, and also by means of an electric current passing through the pencils.

Incandescing Conductor for Electric Lamps; Thomas A. Edison, of Menlo Park, N. J..... 297,585

Consists of a carbonized tightly twisted strip of paper.

Indestructible Compound for Coating Wires for Electrical Purposes; Joel H. Page, of Philadelphia, Pa., Assignor to Blanch Carrie King, of same place..... 297,622

Consists of a mixture of litharge and glycerine.

Incandescent Electric Lamp; Thomas A. Edison, of Menlo Park, N. J., Assignor to the Edison Electric Light Co., of New York, N. Y... 297,581

The sealed globe of the lamp is provided with a residual atmosphere consisting almost entirely of carbonic monoxide.

Pin for Electric Insulators; John M. Klein, of San Francisco, Cal..... 297,699

Consists in providing an insulator-pin of metal, having a head, of larger diameter than the body of the pin, on which is a screw-thread or portion of a thread of proper size to be inserted into and to engage with the screw-socket of the insulator.

Telephone Line; Thomas B. Doolittle, of Bridgeport, Conn..... 297,683

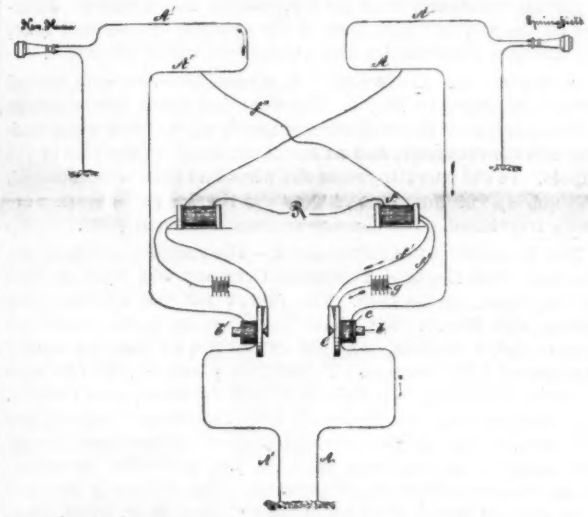
The supporting pins, or insulators, are constructed of wood, and the parts exposed to the atmosphere are covered with water-proof paint or varnish.

Telephone Transmitter; Daniel Drawbaugh, of Eberly's Mills, Pa., Assignor to the People's Telephone Co., of New York.... 297,578

The two electrodes not in contact, but are connected by a third electrode resting upon them by gravity simply.

Telephone Repeater; Daniel E. Smith, of Hartford, Ct..... 297,724

The electrical undulations caused by talking into the telephone at Springfield are repeated by the transmitter through the primary circuit of the induction-coil, amplified in the secondary



circuit of the coil, and pass through to the main line to the farther station, the rheostat interposed between the induction-coils on this secondary circuit being of a sufficient resistance to more than counterbalance the resistance of the wires on either side of the repeating-station, and the main part of the waves, therefore, following the path of the least resistance, are repeated in the telephone at New Haven, the farther station. The use of this interposed resistance is to prevent a great portion of the currents from one station from passing over the line to the farther station without passing through the coil *b* or *b'*. Whatever current is generated at the transmitter at one station is thus made effective at the repeating-magnet, and the great resistance of the secondaries of the two induction-coils, together with the extra resistance *R*, will divert the greater part of such current into the desired channel, viz.: through the repeating-magnets *b* or *b'*.

Telephone Mouth and Ear Piece; Francis Ware, of Boston, Mass..... 297,732

Consists in a detachable mouth or ear piece formed of two hemispherical sections united by a conical section, which connects the base of the larger of the two hemispheres with the apex of the smaller.

Telephone Cable; Franz C. Guilleaume, of Cologne, Prussia, Germany..... 297,688

Composed of strands wrapped spirally around a core-strand of non-insulated wire, the wrapping-strands being composed of a series of insulated wires wrapped spirally around a single non-insulated wire. The whole is inclosed in lead.

Telephone Station Apparatus; Edward M. Bently, of Brooklyn, N. Y..... 297,909

Consists in devices whereby the telephonic apparatus is brought by a single movement into listening position, the same movement making all the necessary circuit connections, and, if desired, also operating the signaling generator.

Underground Conduit for Electric Wires; Christian H. Goebel, of Philadelphia, Pa., Assignor to the Goebel Sectional Electric Underground and Pneumatic Delivery Company of N. J..... 297,926

Consists of a conduit adapted to sustain telegraph, telephone, electric light, and other wires, the same being formed of a tube having ledges for the wires and tracks for a reel used in laying the wires. Also in various detailed devices for operating the reel.

Underground Conduit for Electric Wires and Pneumatic Tube Combined; Christian H. Goebel, of Philadelphia, Pa., Assignor to the Goebel Sectional Electric Underground and Pneumatic Delivery Company of New Jersey..... 297,929

Consists of a pneumatic tube, the piston of which carries wire which is to be laid in a conduit communicating with the tube. This pneumatic tube is combined with a carrier for the wire, and a communicating slot between the tube and conduit, which is opened by the carrier in laying the wire and closed by the same thereafter.